

## (12) UK Patent Application (19) GB (11) 2 134 960 A

(21) Application No 8301608  
 (22) Date of filing 21 Jan 1983  
 (43) Application published  
 22 Aug 1984  
 (51) INT CL<sup>3</sup>  
 E05B 55/08

(52) Domestic classification  
 E2A 106 118 160 171  
 190 420 510 554 AR PE  
 U1S 1714 E2A

(56) Documents cited  
 GB 0846983  
 GB 0797583

(58) Field of search  
 E2A

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## (54) Locking device

(57) The longitudinal edge portions of an elongate retaining element 6 cooperates respectively with an elongate abutment 12 on a bolt 2 and an elongate abutment 8 on a lateral housing wall 3 in order to prevent the bolt from being forced back from its locking position. Element 6 is spring-urged and automatically takes up its holding position when the bolt is shot. The bolt is moved by the camming

device 13, one arm 14 of which pushes the element 6 back into its groove 9 whilst the other 17 withdraws the bolt.

Fig. 7 shows an adaptation for a latch-bolt wherein bolt 2 is spring-urged to its extended position, but element 6 only engages the bolt abutment when sensor 27 is depressed—such as by the edge of a keeper in which the bolt 2 is engaged—to align its notch 31 with the element 6.

In other embodiments, not shown, the element may be of square cross-section or of a major sector of a circle, in all embodiments the element extends across the width of the bolt.

Fig. 10 shows a feature which may be added to the above to prevent door forcing.

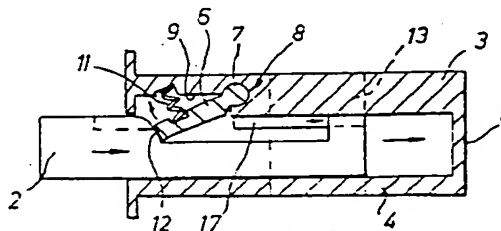


FIG. 1.

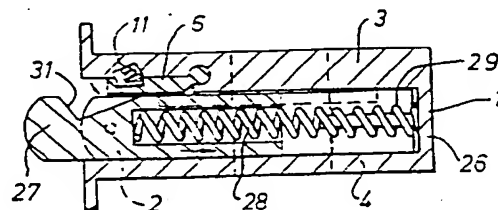


FIG. 7.

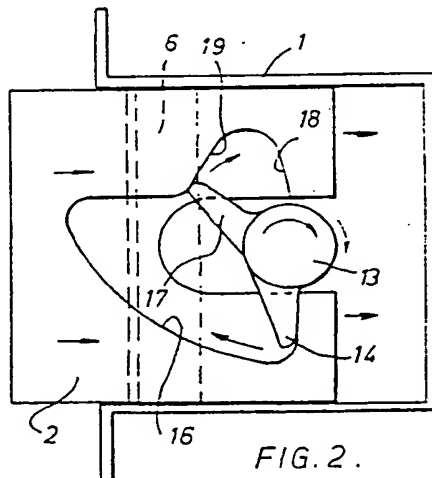


FIG. 2.

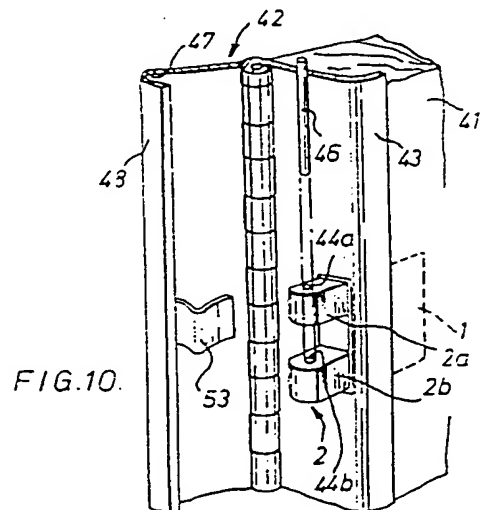
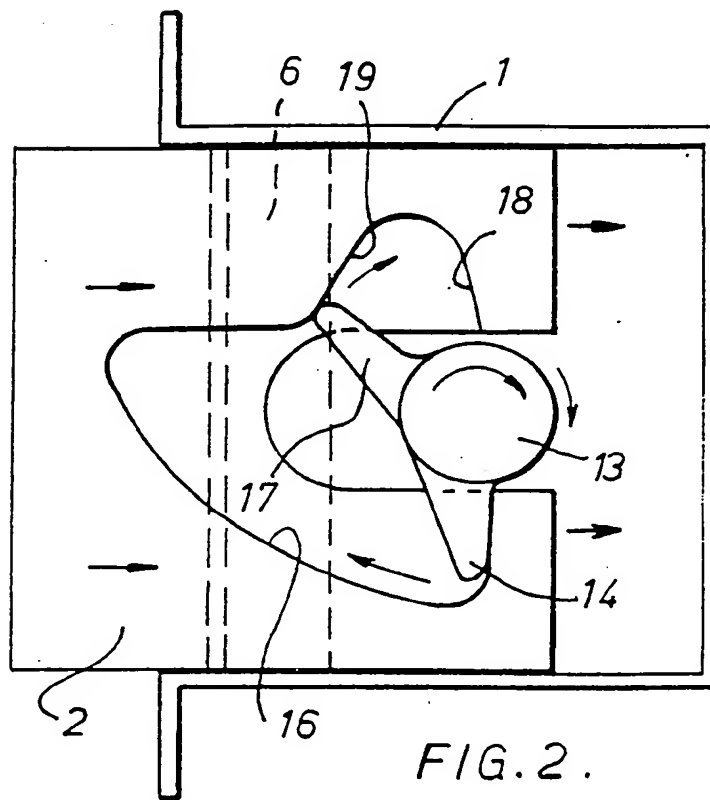
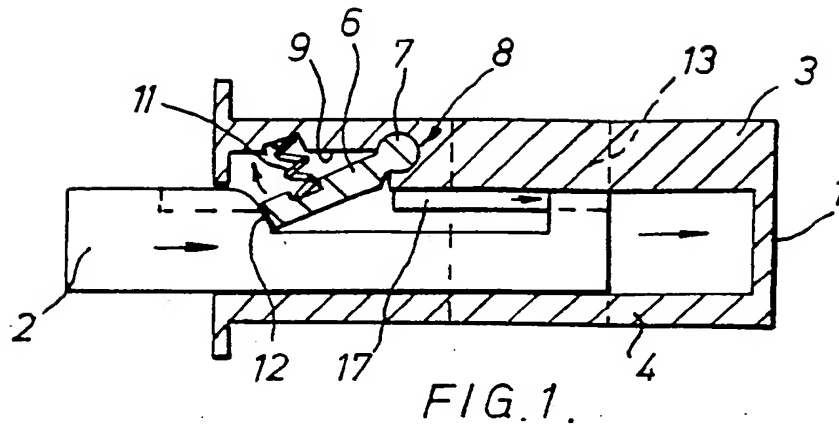
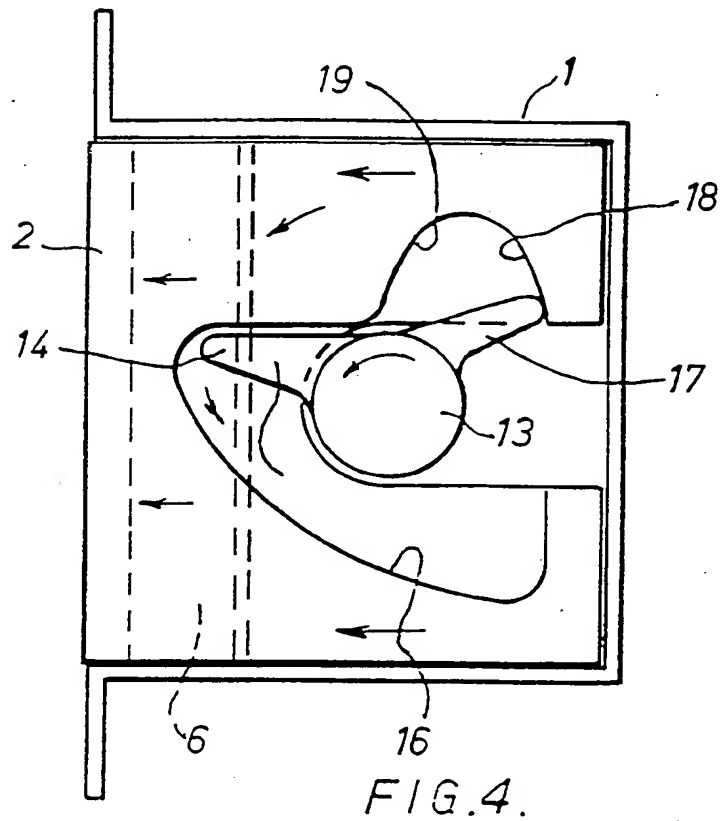
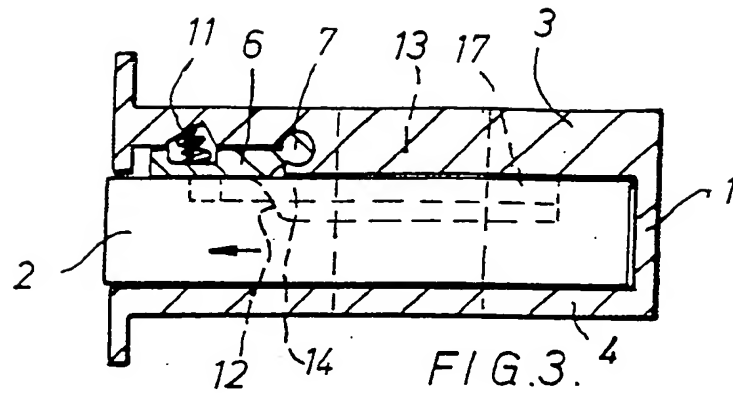


FIG. 10.

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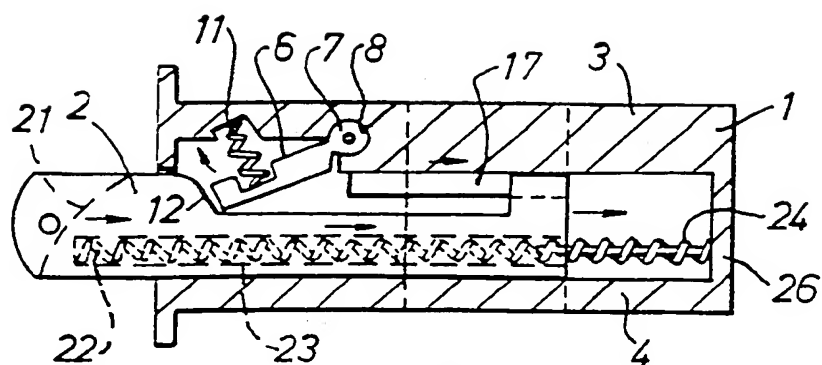


FIG. 5.

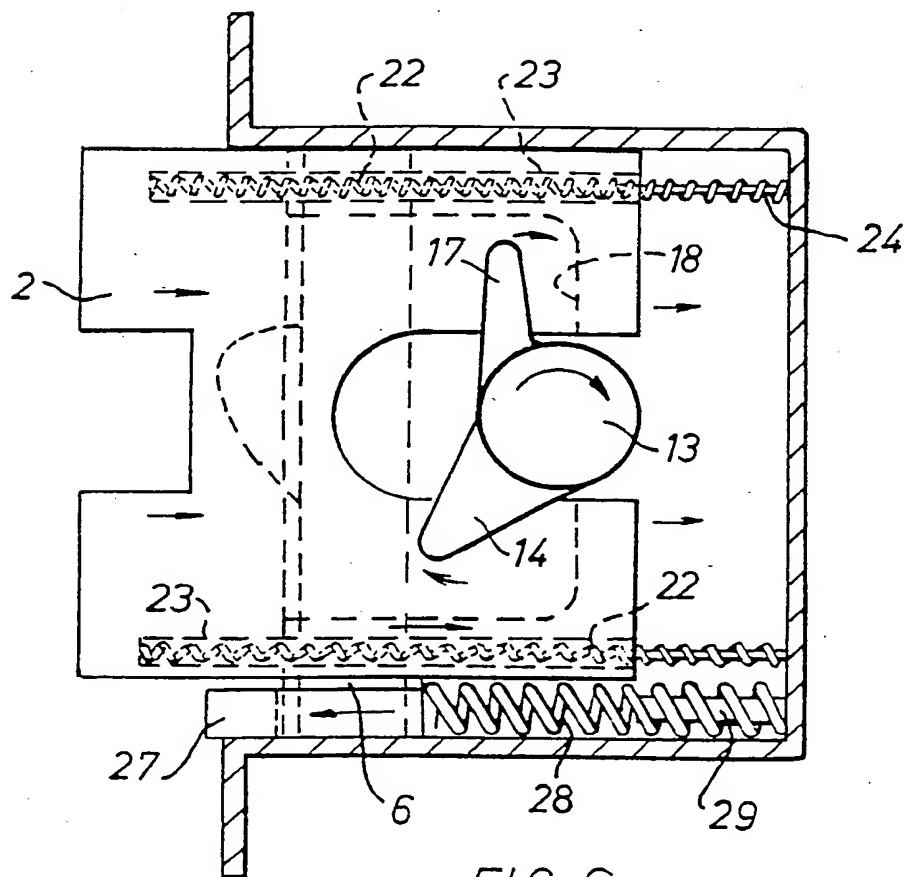


FIG. 6.

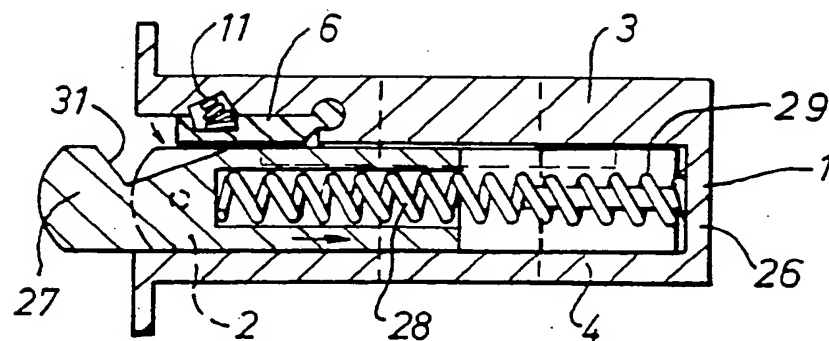


FIG. 7.

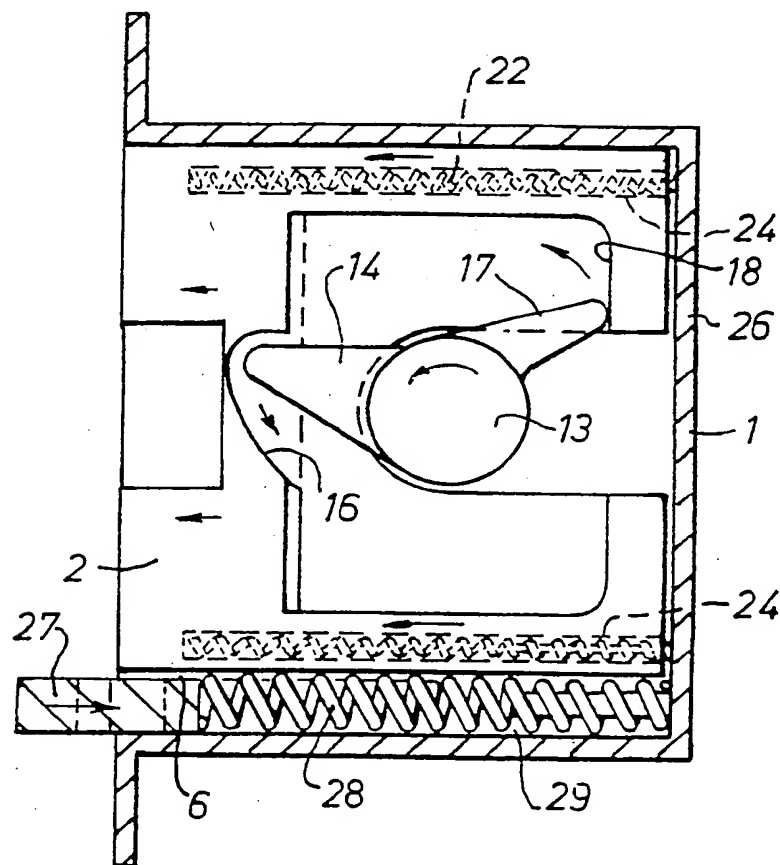


FIG. 8.

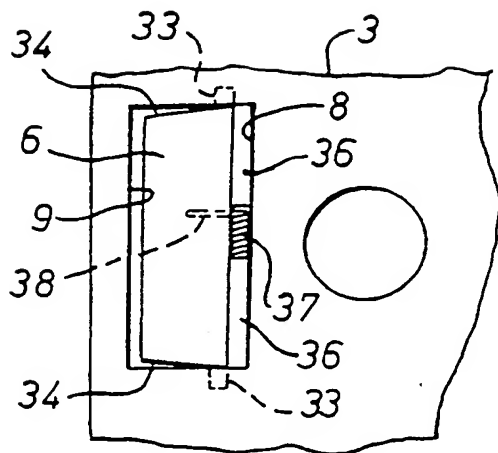


FIG. 9.

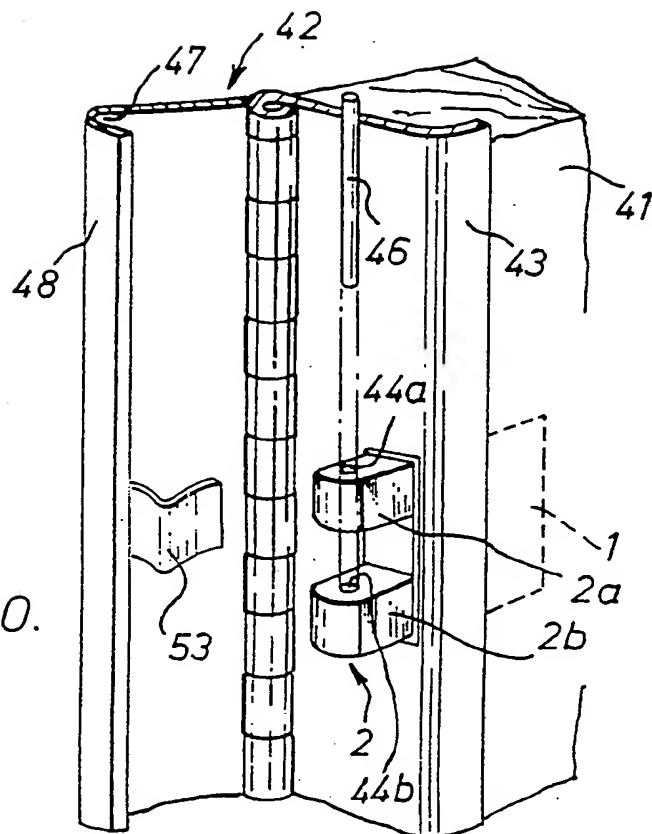


FIG. 10.

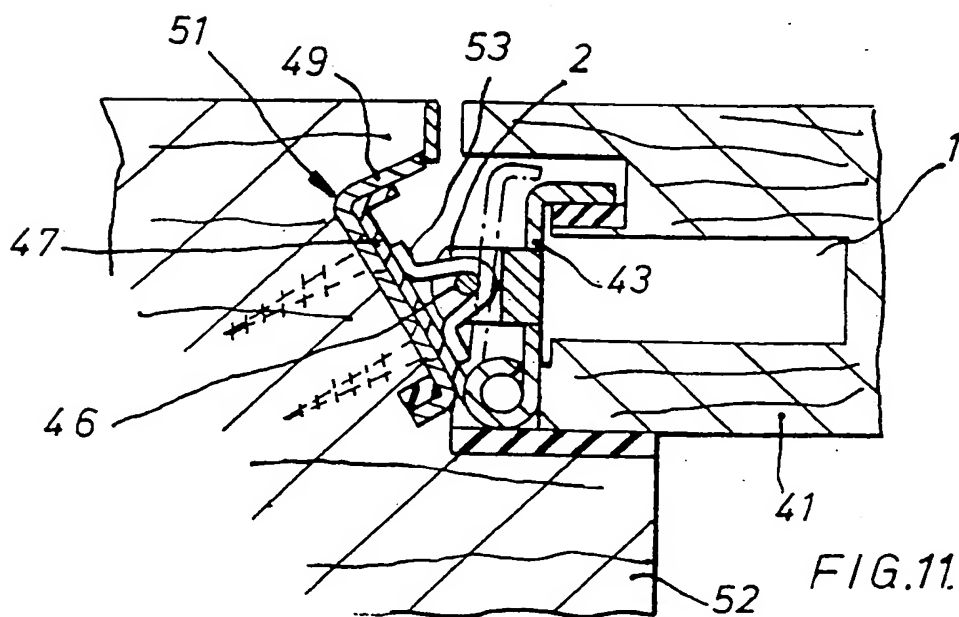
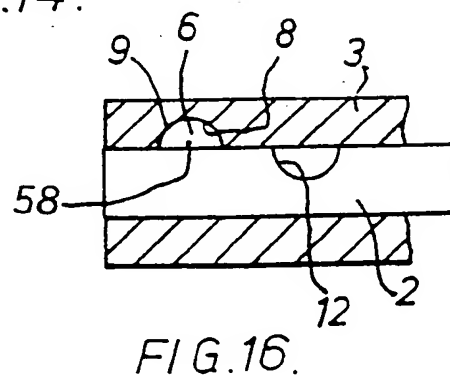
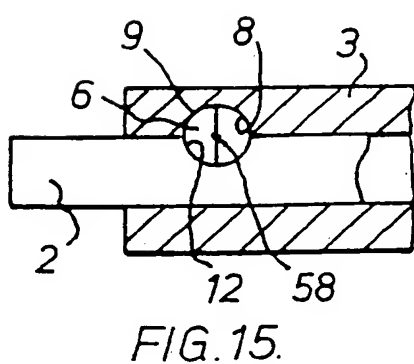
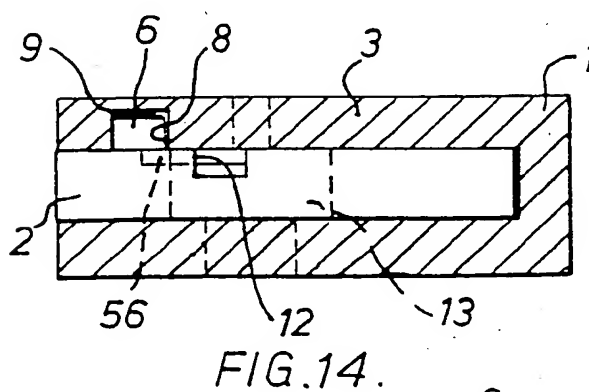
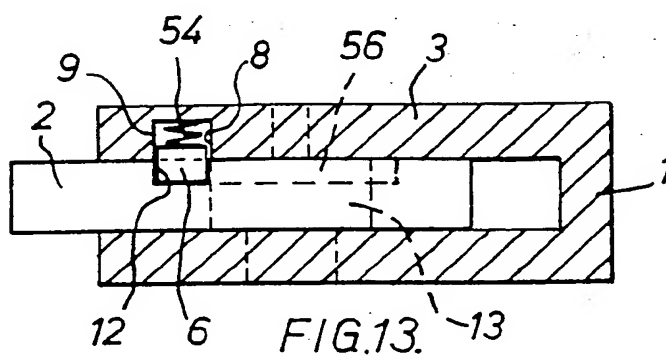
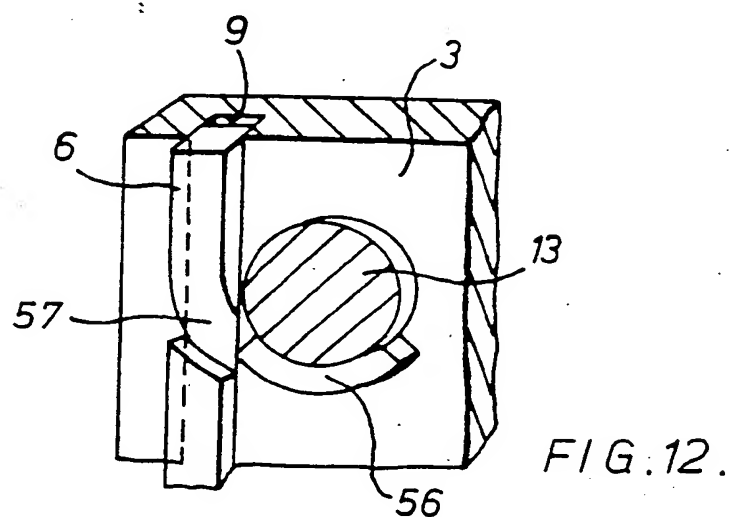


FIG. 11.



## SPECIFICATION

### Locking device

This invention relates to a locking device of the type known as a deadlock, which has a locking member mounted in a housing for movement to and from a locking position and retaining means for preventing the locking member from being pushed back from the locking position.

Conventional deadlocks are bulky and complex. Furthermore, it is usually possible to force back the locking member of a conventional deadlock by applying a force sufficient to overcome the shearing or bending resistance of a comparatively weak component of the retaining means.

The present invention substantially overcomes this problem by providing an elongate retaining element which engages, along substantially the whole of its length, between the locking member and a lateral wall of the housing, thereby occupying only a small space and preventing forcing of the locking member by virtue of the high resistance of the elongate retaining element to deformation by transverse forces distributed along the whole of its length.

Accordingly, the present invention provides a locking device comprising a housing, a locking member mounted in the housing and guided between lateral walls of the housing for movement to and from a locking position in which it projects from the housing, and an elongate retaining element mounted within the housing between one of its lateral walls and the locking member, and in which, when the locking member is in its locking position, the retaining element is laterally movable to and from a retaining position in which one longitudinal edge portion of the retaining element cooperates with an elongate abutment provided on the locking member and the other longitudinal edge portion cooperates with a substantially parallel elongate abutment provided on the said one lateral wall, so as to prevent the locking member from being forced away from its locking position into the housing.

The longer the abutments and the retaining element, the greater the resistance of the element to force applied to the locking member. Preferably, the elongate retaining element extends over at least a major part of the corresponding dimension of the locking member.

In the preferred embodiment, the two abutments face each other when the locking member is in the locking position. In this arrangement, an attempt to force the locking member compresses the retaining element between the abutments. The element, which may be mounted on the locking member or, preferably, on the lateral wall, is preferably oblique to the lateral wall in the retaining position, thereby producing a wedging effect if the locking member is urged into the housing. Alternatively, an arrangement can be envisaged in which the abutments face away from each other and the longitudinal edge portions of the retaining element are constituted by flanges which

cooperate with the abutments so that, if an attempt is made to force the locking member, the retaining element is put under tension transversely to its length.

The movement of the retaining element to and from its retaining position is preferably (but not necessarily) pivotal movement and it is preferable for the element to be hinged adjacent one of the abutments, conveniently the abutment in the housing wall. In one embodiment, resiliently deformable material is interposed between the retaining element and one or both of the abutments, in order to dissipate impacts which might be applied to the locking device in an attempt to force the locking member away from its locking position. The deformable material may be carried by the retaining element and/or the abutment(s).

The retaining element may be urged into its retaining position by spring means and may be moved out of its retaining position by release means which may conveniently be combined with means for moving the locking member out of its locking position. The locking member may be rotated to and from its locking position, e.g. it may be a hook bolt, but preferably it moves rectilinearly. The locking member may be urged into its locking position by spring means, e.g. it may be a roller bolt or latch bolt. In this case it will be advantageous to arrange for the retaining element to be moved into its retaining position automatically when the locking element engages a rebate in a striking plate for example. This can be achieved by providing an actuating element projecting from the housing adjacent the locking member and holding the retaining element out of its retaining position, the actuating element being actuatable (e.g. by a striking plate) to release the retaining element.

Movement of the locking member out of its locking position can be provided by any convenient operating means, e.g. actuated by a mechanical, magnetic, or other key or by electrical means such as a microswitch. Preferably, the operating means is arranged within the length of the locking member, so that the space occupied by the locking device can be minimised. The retaining element preferably, but not necessarily, lies between the locking means and the projecting part of the locking member, for the same reason. A preferred operating means comprises a rotary member comprising a first element for moving the retaining element out of its retaining position and a second element for moving the locking member out of its locking position.

Since the locking device is simple in construction, using only a small number of moving parts, it can be made as small as desired, the only effective limitation being the required size of the locking member and operating mechanism for any particular application. By making the retaining element extend over substantially the whole of the width of the locking member, the device can be provided with great resistance to forcing, even if the housing is greatly

reduced in size compared with conventional locks. Accordingly, it is highly suitable for use not only on doors, particularly security doors, but also on windows, cupboard doors, drawers, and cases, for example. It is to be noted that a separate retaining element may be provided on each side of the locking member, if desired.

In a preferred embodiment of locking device the housing is connected to a first leaf through which the locking member projects in its locking position, the first leaf being hinged to a second leaf along one longitudinal edge portion, the second leaf being acted upon by the locking member so that, when the locking member is in its locking position, the second leaf is at an acute angle to the first leaf and its free longitudinal edge portion is capable of engaging an elongate step (e.g. provided in a door-post). In this way, great resistance to breaking-open of the locking device when the said edge portion is engaged can be achieved by making the hinged leaves sufficient long.

The invention will be described further, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a schematic horizontal section through a locking device, with its locking member in the locking position;

Figure 2 is a schematic vertical section corresponding to Figure 1;

Figure 3 is a view similar to Figure 1, but with the locking member withdrawn;

Figure 4 is a schematic vertical section corresponding to Figure 3;

Figures 5 to 8 are similar to Figures 1 to 4, respectively, but show another embodiment of the locking device;

Figure 9 is a fragmentary side view of a retaining element in another embodiment;

Figure 10 is a fragmentary perspective view of a modified locking device;

Figure 11 is a horizontal section corresponding to Figure 10;

Figure 12 is a fragmentary perspective view of a retaining element in another embodiment;

Figures 13 and 14 are fragmentary horizontal sections corresponding to Figure 12, with the locking member in the locking position and the withdrawn position respectively; and

Figures 15 and 16 are similar views of another embodiment of retaining element.

The locking device illustrated in Figures 1 to 4 has a housing 1, preferably of metal such as hardened steel, which is to be received in a mortice in a door, for example. The housing 1 may be as small as 3cm x 3cm x 1cm, for example, but can of course be of any desired size depending on the required strength of the locking device. A locking member in the form of a sliding bolt 2 is guided between lateral walls 3, 4 of the housing 1 for movement between a locking position (Figures 1 and 2) in which the bolt 2 projects from the housing and a withdrawn position (Figures 3 and 4) in which it lies substantially wholly within the housing. The bolt

2 is preferably of metal such as hardened steel or brass with hardened steel inserts.

A retaining element in the form of a metal flange 6 whose length is preferably equal to the width (height) of the bolt 2 is mounted in the housing 1 between its lateral wall 3 and the bolt 2. One edge of the flange 6 is hinged at 7 as shown (or by a pin or pivot points), adjacent to an elongate abutment 8 in a recess 9 in the wall 3 capable of accommodating the flange 6. With the bolt 2 in its locking position (Figures 1 and 2) the flange 6 is urged by a spring 11 (or a series of springs spaced along it) to a retaining position (as shown) in which it extends obliquely to the wall 3 (preferably at an angle less than 30°, e.g. 20° or less) and its free edge cooperates with an abutment or step 12 in the bolt 2 so as to prevent the bolt from being forced back into the housing. Resiliently deformable material (e.g. rubber or resilient plastics) may be applied to the abutment 8, the abutment 12, or one or both of the abutting surfaces of the flange 6, to dissipate impacts.

To release the retaining flange 6 and withdraw the bolt 2, a rotary member 13 (which may form part of an operating means such as a cylinder lock or other means actuated by an electrical, magnetic, optical, or mechanical code) is turned clockwise (Figure 2). In the drawings the arrows indicate the movements which are about to occur. The member 13 has a first element 14 which moves freely within a cavity 16 in the bolt 2 and comes in contact with the flange 6, pushing it into the recess 9. Immediately after, a second element 17 on the rotary member 13 bears against a cam surface 18 in the bolt 2 and pushes the bolt back into its withdrawn position (Figures 3 and 4).

The bolt 2 is moved to its locking position by turning the rotary member 13 anticlockwise, so that the first element 14 initially releases the flange 6 (which is, however, held in the recess 9 by the bolt 2, as seen in Figure 3) and then the second element 17 bears against a cam surface 19 in the bolt 2 and pushes the bolt into its locking position while the flange 6 is simultaneously urged into engagement with the abutment 12 by the spring 11.

In the locking device illustrated in Figures 5 to 8 (which is basically similar to the above-described device), the bolt 2 is a roller bolt (as shown in full line—but with the roller omitted for clarity) or a latch bolt (as indicated in broken line at 21) and is urged into the locking position (Figures 5 and 6) by two compression springs 22 contained in blind longitudinal bores 23 in the bolt and guided by pins 24 fixed to the rear wall 26 of the housing 1.

When the bolt 2 is engaged in a rebate in a striking plate (not shown) an actuating element 27 adjacent the bolt is pushed (by the striking plate) into the housing 1 against the action of a spring 28 also guided by a pin 29 fixed to the rear housing wall 26. In this position (Figure 6), a recess 31 (Figure 7) in the actuating element 27 lies adjacent the retaining flange 6 (which in this case is extended below the bolt 2) and allows the

flange to be urged into engagement with the abutment 12 by the spring 11.

The bolt 2 is withdrawn by the rotary member 13 in the manner described previously.

5 Figure 9 illustrates an alternative way of mounting the retaining element or flange 6. Here the flange has integral pins 33 received in blind bores in the lateral wall 3 of the housing. The upper and lower ends 34 of the flange 6 slope slightly inwards away from the pins 33, so as to reduce friction on entering and leaving the recess 9. Two resiliently deformable strips 36 are interposed between the flange 6 and the abutment or step 8, with a space between them which accommodates a coil spring 37, one end 38 of which engages behind the flange 6 to urge it into the retaining position, while the other end (not shown) is fixed.

20 The locking device illustrated in Figures 10 and 11 is a modification of either one of the locking devices described above and substantially upgrades side pressure resistance. The housing 1 is shown mounted in a mortice in a wooden member 41 which may be a door or the face of a drawer. A piano-type hinge 42 has a first leaf 43 which is fixed to the member 41 (and therefore to the housing 1). The bolt 2 is bifurcated and its limbs 2a, 2b have aligned holes 44a, 44b through which a pin 46 passes. The bolt 2, in its locking position, projects through the leaf 43 and acts on the second leaf 47 to place it at an acute angle to the first leaf 43 so that its free longitudinal edge portion 48 engages an elongate step 49 provided by a striking plate 51 mounted in a fixed frame member 52. The pin 46 in the bolt 2 passes through a bracket 53 on the leaf 47 so that the leaf 47 is pulled clear of the step 49 when the bolt 2 is withdrawn.

40 In the locking device shown in Figures 12 to 14 the retaining element 6 is of square section and is urged out of the recess 9 by a pair of upper and lower leaf springs 54 behind it. An element 56 on the periphery of the rotary member 13 acts on a ramp surface 57 of the element 6 so as to push it into the recess 9 in order to allow the bolt 2 to be withdrawn (Figure 14).

45 In the locking device shown in Figures 15 and 16, the elongate retaining element 6 and the recess 9 have the cross-sectional shape of a major segment of a circle. The element 6 is pivoted on an axis 58 passing through the centre of the circle.

#### Claims

1. A locking device comprising a housing, a locking member mounted in the housing and guided between lateral walls of the housing for movement to and from a locking position in which it projects from the housing, and an elongate retaining element mounted within the housing between one of its lateral walls and the locking member, and in which, when the locking member is in its locking position, the retaining element is

65 laterally movable to and from a retaining position in which one longitudinal edge portion of the element cooperates with an elongate abutment provided on the locking member and the other longitudinal edge portion cooperates with a substantially parallel elongate abutment provided on the said one lateral wall, so as to prevent the locking member from being forced away from its locking position into the housing.

2. A locking device as claimed in claim 1, in which, when the locking member is in the locking position, the two abutments face each other.

75 3. A locking device as claimed in claim 2, in which, in its retaining position, the retaining element is oblique to the said one lateral wall.

4. A locking device as claimed in any preceding claim, in which the retaining element is pivotally mounted.

80 5. A locking device as claimed in any preceding claim, in which resiliently deformable material is interposed between at least one longitudinal edge portion of the retaining element and at least one of the abutments.

85 6. A locking device as claimed in any preceding claim, in which the elongate retaining element extends over at least a major part of the corresponding dimension of the locking member.

90 7. A locking device as claimed in any preceding claim, including spring means for urging the retaining element into its retaining position, and release means for moving the retaining element out of its retaining position.

95 8. A locking device as claimed in any preceding claim, including means for moving the locking member into its locking position and operating means for moving the retaining element out of its retaining position and subsequently moving the locking member out of its locking position.

100 9. A locking device as claimed in claim 8, in which the first-mentioned means are spring means.

105 10. A locking device as claimed in claim 9, including an actuating element projecting from the housing adjacent the locking member and holding the retaining element out of its retaining position, the actuating element being actuable to release the retaining element.

110 11. A locking device as claimed in any of claims 8 to 10, in which the retaining element lies between the operating means and the part of the locking member which projects from the housing in the locking position.

115 12. A locking device as claimed in any preceding claim, in which the housing is connected to a first leaf through which the locking member projects in its locking position, the first leaf being hinged to a second leaf along one longitudinal edge portion, the second leaf being acted upon by the locking member so that, when the locking member is in its locking position, the second leaf is at an acute angle to the first leaf and its free longitudinal edge portion is capable of engaging an elongate step.

13. A locking device substantially as described with reference to, and as shown in, Figures 1 to 4, Figures 5 to 8, Figure 9, Figures 10 and 11,

Figures 12 to 14, or Figures 15 and 16 of the 5 accompanying drawings.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1984. Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.